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**Claims**

We claim:

- 10 1. A chitosan-calcium (II) complex, comprising: calcium (II) ions bound to a gel of a chitosan salt, wherein said complex contains  $\geq 0.5$  wt% chitosan having an average molecular weight  $\geq 10$  kD, a polydispersity  $\geq 2.0$ , deacetylation degree  $\geq 65\%$  and wherein said complex has a water retention value  $\geq 300\%$ ,  $\text{pH} \leq 6.9$  and a calcium (II) ion content  $\geq 0.1$  wt% relative to chitosan.
- 15 2. A chitosan-calcium complex according to claim 1, wherein said calcium (II) ions are bound with the chitosan gel by coordinate bonds or hydrogen bonds.
- 20 3. A chitosan-calcium (II) complex according to claim 1, wherein said complex is water soluble.
- 25 4. A method to produce a chitosan-calcium complex from a gel of a chitosan salt, comprising the steps of:
  - 25 a) providing a suspension containing  $\geq 0.01$  wt % chitosan gel, said gel having an average polymerization degree  $\geq 10\text{kD}$ , a polydispersity  $\geq 2.0$ , and deacetylation degree  $\geq 65\%$ ; and
  - 30 b) mixing said chitosan gel with  $\geq 0.01$  wt% calcium (II) salt to form said complex;
- wherein said complex has a water retention value  $\geq 300\%$  and a  $\text{pH} \leq 6.9$ .
- 35 5. A method according to claim 4, wherein said calcium (II) salt is selected from the group consisting of calcium chloride and calcium acetate.
6. A method according to claim 5, wherein said calcium (II) salt concentration is 10-50 wt% relative to chitosan.
- 40 7. A method according to claim 4, wherein said mixing step is carried out at a temperature  $\geq 10^\circ\text{C}$ .
8. A method according to claim 7, wherein said mixing step is carried out at a temperature between  $20^\circ\text{C}$  and  $40^\circ\text{C}$ .
- 45 9. A chitosan-calcium (II) complex prepared according to the method of claim 4.
- 50 10. A method of preparing chitosan salt gels, comprising the steps of:
  - a) degrading chitosan in an aqueous acidic solution with enzymes, said solution having a chitosan concentration of  $\geq 0.5$  wt% for a desired time and at a desired temperature;

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- b) deactivating said enzymes after said desired time is completed;
- c) adding an aqueous basic solution to said enzyme/aqueous chitosan mixture to attain  $4.0 \leq \text{pH} \leq 6.0$ ; and
- 10 d) continuously mixing said mixture until a gel of a chitosan salt forms.
11. A method according to claim 10, wherein said gel forms at  $6.3 \leq \text{pH} \leq 6.9$ .
- 15 12. A method according to claim 10, wherein said aqueous acidic solution comprises an acid selected from the group consisting of hydrochloric acid, acetic acid and lactic acid.
- 20 13. A method according to claim 10, wherein said enzymes are selected from the group consisting of chitanases, cellulases and xylanases.
14. A method according to claim 10, wherein said aqueous basic solution comprises a member selected from the group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate and potassium carbonate.
- 25 15. A method according to claim 10, wherein the concentration of chitosan in said aqueous acidic solution is between about 1 wt% and 3 wt%.
16. A method according to claim 10, wherein said degrading step is carried out at a temperature  $\geq 10^\circ\text{C}$ .
- 30 17. A method according to claim 10, wherein said degrading step is carried out at a temperature between about  $20^\circ\text{C}$  and  $60^\circ\text{C}$ .
18. A method according to claim 10, wherein said deactivating step is carried out at a temperature  $\geq 70^\circ\text{C}$ .
- 35 19. A method according to claim 10, wherein said aqueous basic solution has a concentration of between about 5 wt% and 10 wt%.
- 40 20. A method according to claim 10, wherein said method is a batch process.
21. A method of preparing a gel of a chitosan salt, comprising the steps of:
- 45 a) degrading chitosan hydrolytically, said chitosan being dissolved in an aqueous acidic solution, said solution having a chitosan concentration of  $\geq 0.5 \text{ wt\%}$  for a desired time and at a desired temperature;
- b) adding an aqueous basic solution to the mixture of step a) to attain  $4.0 \leq \text{pH} \leq 6.0$ ; and
- 50 c) continuously mixing the product of step b) until a gel of a chitosan salt forms.

- 5 22. A method according to claim 21, wherein said step a) utilizes an acid selected from the group consisting of hydrochloric acid and chloroacetic acid.
23. A method according to claim 22, wherein the concentration of said acid used is at least 0.01 wt%.
- 10 24. A method according to claim 21, wherein step a) is carried out at a temperature of  $\geq 20^{\circ}\text{C}$ .
- 15 25. A method according to claim 24, wherein said temperature is between  $40^{\circ}\text{C}$  and  $80^{\circ}\text{C}$ .
26. A method according to claim 21, wherein said aqueous acidic solution comprises hydrochloric acid, acetic acid or lactic acid.
- 20 27. A method according to claim 24, wherein said aqueous acidic solution has a chitosan concentration of between 1 wt% and 3 wt%.
- 25 28. A method according to claim 21, wherein said aqueous basic solution comprises a base selected from the group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate and potassium carbonate.
29. A method according to claim 28, wherein said aqueous basic solution has a concentration of 5 wt% to 10 wt%.
- 30 30. A method according to claim 21, wherein said gel forms at  $6.3 \leq \text{pH} \leq 6.9$ .
31. A method according to claim 21, wherein said method is a batch process.
- 35 32. A method according to claim 21, wherein said chitosan concentration in said aqueous acidic solution is between 1 wt% and 3 wt%.
- 40 33. A method of preparing a chitosan salt gel, comprising the steps of :
- 45 a) degrading chitosan with an oxidizing agent, said chitosan being dissolved in an aqueous acidic solution, said solution having a chitosan concentration of  $\geq 0.5$  wt% for a desired time and at a desired temperature;
- b) adding an aqueous basic solution to the mixture of step a) to attain  $4.0 \leq \text{pH} \leq 6.0$ ; and
- 50 c) continuously mixing the product of step b) until a gel of a chitosan salt forms.
34. A method according to claim 33, wherein said oxidizing agent is selected from the group consisting of hydrogen peroxide and sodium perborate.

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35. A method according to claim 33, wherein said aqueous acidic solution comprises a member of the group consisting of hydrochloric acid, acetic acid and lactic acid.

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36. A method according to claim 33, wherein said concentration of chitosan is between 1 wt% and 3 wt %.

37. A method according to claim 33, wherein the concentration of said oxidizing agent is  $\geq 0.001$  wt%.

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38. A method according to claim 37, wherein the concentration of said oxidizing agent is between 0.01 and 0.5 wt %.

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39. A method according to claim 33, wherein said aqueous basic solution comprises a member selected from the group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate and potassium carbonate.

40. A method according to claim 39, wherein said aqueous basic solution has a concentration of between 5 wt% and 10 wt%.

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41. A method according to claim 33, wherein said gel forms at  $6.3 \leq \text{pH} \leq 6.9$ .

42. A method according to claim 33, wherein said method is a batch process.

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